

## Power Generation using PVDF on a Credit-Card

R H Brown, adapted from data obtained on 27 July 1998

A piece of metallised 28  $\mu\text{m}$  PVDF was cut to 53 x 80 mm dimensions and bonded to a simple 0.8 mm credit card using double-coated adhesive tape. Flexing the card while supporting each short edge was found to develop high open-circuit voltage (peaks typically in the region of 50 to 60 V). The source capacitance was measured at 14.4 nF.

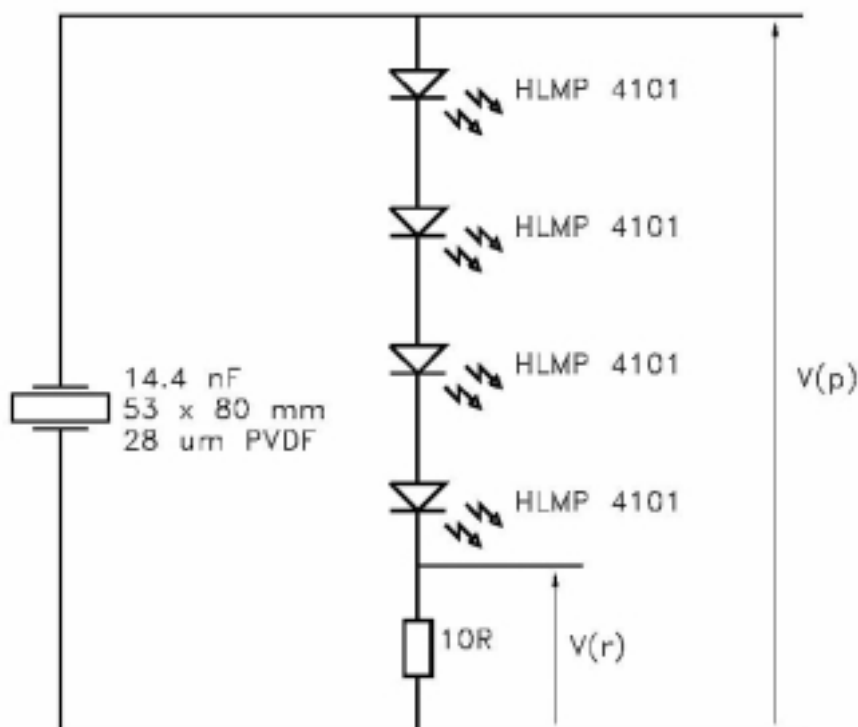
Using the circuit arrangement shown (below), the voltages  $V(p)$  and  $V(r)$  were recorded. The four series-connected LEDs clamped the peak voltage to around 5.2 V. The current was calculated from the measured voltage across the 10 ohm resistor.

Flexing the card quite quickly was found to generate peak current of around 200  $\mu\text{A}$ , maintaining  $>100 \mu\text{A}$  for around 10 ms.

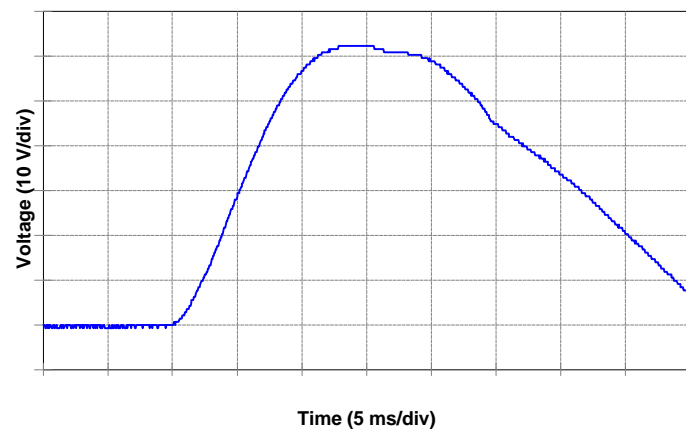
Flicking the card sharply with a fingernail created much higher current surges ( $> 700 \mu\text{A}$ ), but with shorter duration.

The energy dissipated (around 5  $\mu\text{J}$ ) in the relatively low impedance circuit shown is considerably less than the maximum level (approx 26  $\mu\text{J}$ ) achieved under open-circuit conditions.

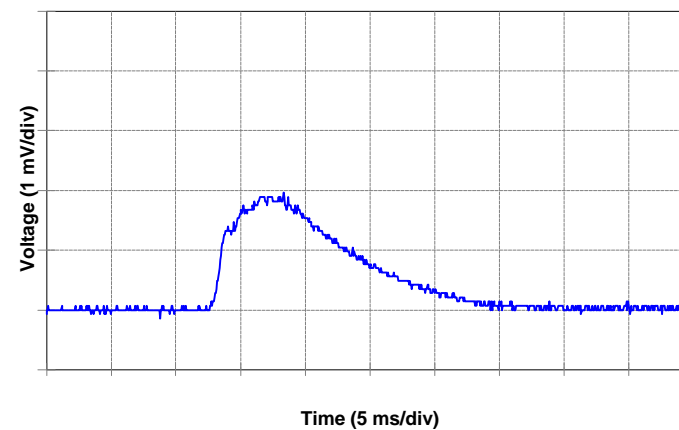
**Conclusion:** Reasonable energy levels are practical from a credit-card size piece of piezo film, but are limited by the means and/or rate of application of force to the substrate.



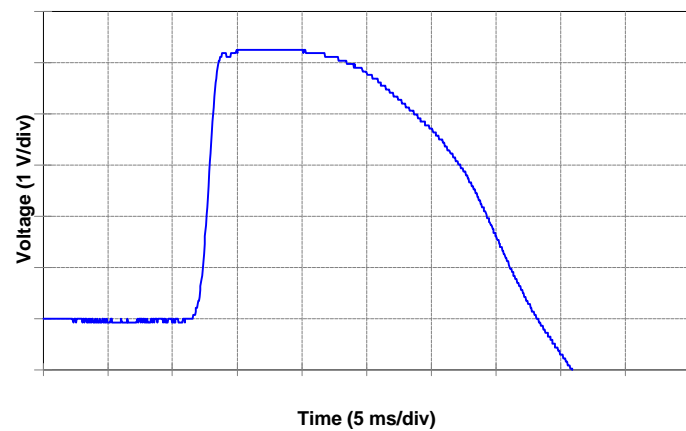
**Open-circuit Voltage Response - Flex**  
28  $\mu\text{m}$  PVDF 14.4 nF 53 x 80 mm



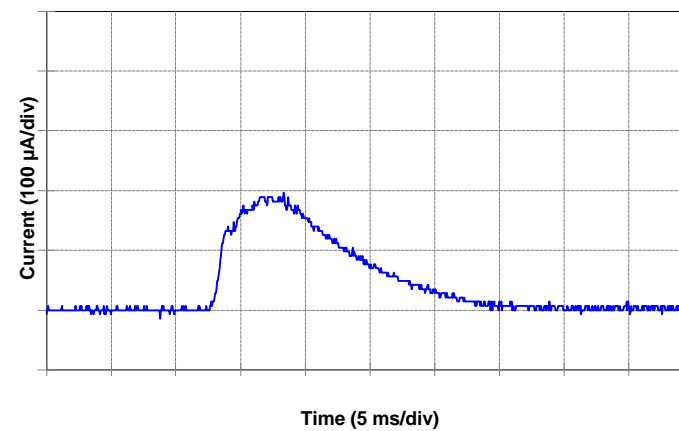
**Voltage V(r) across 10R only - Flex**  
28  $\mu\text{m}$  PVDF 14.4 nF 53 x 80 mm



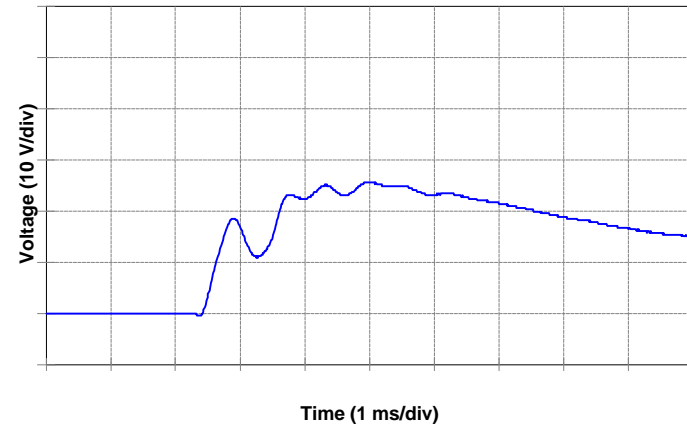
**Voltage V(p) across 4 LED & 10R - Flex**  
28  $\mu\text{m}$  PVDF 14.4 nF 53 x 80 mm



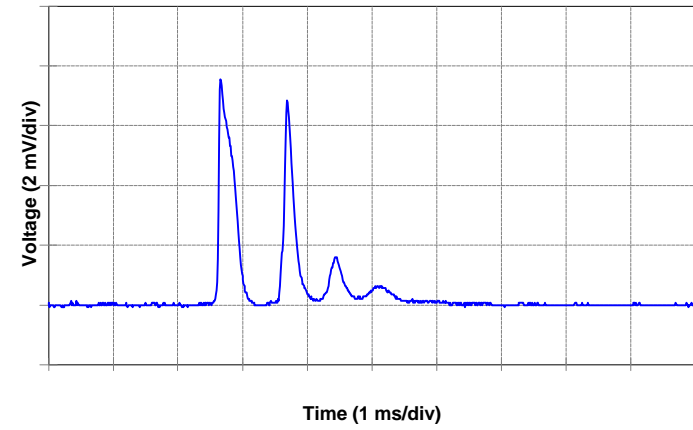
**Current I(r) through 10R - Flex**  
28  $\mu\text{m}$  PVDF 14.4 nF 53 x 80 mm



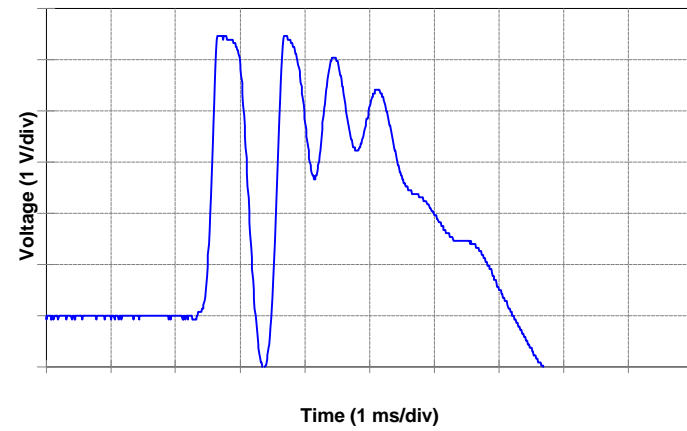
**Open-circuit Voltage Response - Flick**  
28  $\mu\text{m}$  PVDF 14.4 nF 53 x 80 mm



**Voltage  $V(r)$  across 10R only - Flick**  
28  $\mu\text{m}$  PVDF 14.4 nF 53 x 80 mm



**Voltage  $V(p)$  across 4 LED & 10R - Flick**  
28  $\mu\text{m}$  PVDF 14.4 nF 53 x 80 mm



**Current  $I(r)$  through 10R - Flick**  
28  $\mu\text{m}$  PVDF 14.4 nF 53 x 80 mm

